

Listing of the Claims:

1. (Previously Presented) A system for updating objects over a network between a local device and a remote device, the system comprising:

a remote device that is arranged to facilitate updating objects over the network, wherein the remote device comprises:

a first network connection device that is arranged to facilitate communications over the network;

a first data store that is arranged for storing a first object; and

a first processor that is coupled to the first data store and the first network connection device, wherein the first processor is configured for:

computing a first fingerprint function at every byte offset of a first object on the remote device;

chunking the first object on the remote device based on the first fingerprint function;

computing a remote signature for each chunk associated with the first object on the remote device;

generating a remote signature and chunk length list on the remote device, wherein the remote signature and chunk length list is associated with the first object;

transmitting the remote signature and chunk length list with the remote device to the network;

receiving with the remote device a request from the network for transmitting at least one updated object chunk; and

transmitting the at least one updated object chunk over the network; and

a local device in operative communication with the remote device to facilitate updating objects over the network, wherein the local device comprises:

a second network connection device that is arranged to facilitate communications over the network;

a second data store that is arranged for storing a second object; and
a second processor that is coupled to the second data store and the second network connection device, wherein the second processor is configured for:

computing a second fingerprint function at every byte offset of the second object on the local device, where the first and second objects are associated with one another, and where the first fingerprint function is matched to the second fingerprint function;

chunking the second object on the local device based on the second fingerprint function, wherein chunking the first object on the remote device is matched to chunking the second object on the local device;

computing a local signature for each chunk associated with the second object on the local device, wherein computing the local signature is matched to computing the remote signature;

generating a local signature and chunk length list on the local device, wherein the local signature and chunk length list is associated with the second object;

negotiating a chunked transmission of the remote signature and chunk length list from the remote device to the local device over the network such that bandwidth use is minimized for the transfer of the remote signature and chunk length list to the local device;

identifying differences between the first object and the second object by comparing the local signature and chunk length list to the remote signature and chunk length list on the local device;

requesting transmission of at least one updated object chunk from the remote device when differences between the first object and the second object are identified by the local device;

receiving the at least one updated object chunk from the remote device;
and

assembling a copy of the first object on the local device with the at least one updated object chunk.

2. (Cancelled).
3. (Cancelled).
4. (Cancelled).
5. (Cancelled).
6. (Cancelled).
7. (Cancelled).

8. (Previously Presented) The system of claim 1, wherein identifying differences between the first object and the second object on the local device comprises:

comparing the remote signature and chunk length list to the local signature and chunk length list;

identifying at least one difference between the remote signature and chunk length list and the local signature and chunk length list;

mapping the at least one difference to the remote signature and chunk length list; and

identifying the at least one updated object chunk from the mapping between the at least one difference and the remote signature and chunk length list.

9. (Cancelled).
10. (Cancelled).
11. (Cancelled).
12. (Cancelled).
13. (Cancelled).
14. (Cancelled).
15. (Cancelled).
16. (Cancelled).
17. (Cancelled).
18. (Cancelled).

19. (Cancelled).

20. (Cancelled).

21. (Cancelled).

22. (Currently Amended) The system of claim 1, wherein the first processor is further configured for:

chunking the remote signature and chunk length list to provide a chunked remote signature and chunk length list;

computing a recursive remote signature for each chunk associated with the chunked remote signature and chunk length list;

generating a recursive remote signature and chunk length list with the recursive remote signatures;

chunking the local signature and chunk length list on the local device, wherein the chunking the local signature and chunk length list is matched to chunking the remote signature and chunk length list; and

wherein the second processor is further configured for:

computing a recursive local signature for each chunk associated with the chunked local signature and chunk length list, wherein computing the recursive local signature is matched to computing the recursive remote signature;

generating a recursive local signature and chunk length list on the local device with the recursive local signatures and the chunked local signature and chunk length list, wherein generating the recursive local signature and chunk length list is matched to generating the recursive remote signature and chunk length list;

negotiating transmission of the recursive remote signature and chunk length list from the remote device to the local device over the network such that bandwidth use is minimized for the transfer of the recursive remote signature and chunk length list to the local device; [[and]]

identifying differences between the recursive remote signature and chunk length list and the recursive local signature and chunk length list on the local device; and

requesting transmission of at least one updated signature chunk from the remote device when differences are identified between the recursive remote signature and chunk length list and the recursive local signature and chunk length list by the local device.

23. (Cancelled).

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26. (Cancelled).

27. (Cancelled).

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38. (Cancelled).

39. (Cancelled).

40. (Cancelled).

41. (Cancelled).

42. (Previously Presented) The system of claim 22, wherein identifying differences between the recursive remote signature and chunk length list and the recursive local signature and chunk length list on the local device further comprises:

comparing the recursive remote signature and chunk length list to the recursive local signature and chunk length list;

identifying at least one signature chunk that is associated with a difference between the recursive remote signature and chunk length list and the recursive local signature and chunk length list;

mapping the at least one signature chunk to the remote signature and chunk length list;
and

identifying the at least one updated signature chunk from the mapping between the at least one signature chunk and the remote signature and chunk length list.

43. (Previously Presented) The system of claim 1 wherein negotiating the chunked transmission of the remote signature and chunk length list from the remote device to the local device over the network further comprises:

determining a number of iterations for recursive processing based on at least one member of a group comprising: a data size associated with the first object, a data size associated with the second object, an environmental constraint associated with the remote device, an environmental constraint associated with the local device, the characteristics of the network, a usage model associated with the first object, and a usage model associated with the second object, a number of chunk signatures associated with the first object, and a number of chunk signatures associated with the chunked remote signature and chunk length list.

44. (Previously Presented) The system of claim 43, wherein the first processor and the second processor are further configured for executing:

a recursive procedure for processing a signature and chunk length list, comprising:

chunking the signature and chunk length list to provide a chunked signature and chunk length list;

computing a recursive signature for each chunk associated with the chunked signature and chunk length list;

generating a recursive signature and chunk length list with the recursive signatures and the chunked signature and chunk length list;

initializing the signature and chunk length list to the recursive signature and chunk length list when additional iterations are required for recursive processing; and

returning the recursive signature and chunk length list when the recursive procedure has completed the number of iterations;

wherein the first processor is further configured for processing the remote signature and chunk length list with the recursive procedure on the remote device by passing the remote signature and chunk length list to the recursive procedure as the signature and chunk length list, and by returning the recursive remote signature and chunk length list from the recursive procedure; and

wherein the second processor is further configured for processing the local signature and chunk length list with the recursive procedure on the local device by passing the local signature and chunk length list to the recursive procedure as the signature and chunk length list, and by returning the recursive local signature and chunk length list from the recursive procedure.

45. (Cancelled).

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- 63. (Cancelled).
- 64. (Cancelled).
- 65. (Cancelled).
- 66. (Cancelled).
- 67. (Cancelled).
- 68. (Cancelled).
- 69. (Cancelled).
- 70. (Cancelled).
- 71. (Cancelled).
- 72. (Cancelled).
- 73. (Cancelled).
- 74. (Cancelled).
- 75. (Cancelled).
- 76. (Cancelled).
- 77. (Cancelled).

78. (Previously Presented) A computer-implemented method for updating an object between a local device and a remote device, each being separate computing devices, the computer-implemented method comprising the local device performing the following steps:

- partitioning a local object into variably sized chunks;
- computing a signature and a chunk length for each variably sized chunk of the local object, wherein each of the signatures and the chunk lengths create a local chunk list;
- generating a local recursive chunk list by recursively chunking the local chunk list into variably sized recursive chunks;
- receiving a remote recursive chunk list, wherein the remote recursive chunk list is associated with a remote object;
- comparing the remote recursive chunk list to the local recursive chunk list to identify differences between the local chunk list and the remote chunk list;

comparing the remote chunk list to the local chunk list to identify any differences between the local object and the remote object;
sending a request for at least one chunk associated with the remote object when the comparison determines a difference;
receiving the at least one chunk after sending the request; and
assembling an object with the at least one chunk after the at least one chunk is received.

79. (Cancelled).

80. (Cancelled).

81. (Previously Presented) The computer-implemented method of Claim 78, wherein generating the local recursive chunk list, further comprises:

partitioning the local chunk list into variably sized recursive chunks;
computing a recursive signature for each variably sized recursive chunk of the local chunk list; and
assembling the local recursive chunk list with the recursive signatures and recursive chunk lengths.

82. (Previously Presented) The computer-implemented method of Claim 78, wherein partitioning the local object further comprises applying a fingerprint function to the local object to generate fingerprints, and partitioning the local object into the variably sized chunks based on the fingerprints.

83. (Cancelled).

84. (Cancelled).

85. (Cancelled).

86. (Cancelled).

87. (Previously Presented) The computer-implemented method of claim 81, wherein partitioning the local chunk list into recursive chunks further comprises:

- determining at least one recursive chunking parameter;
- determining at least one of a recursive horizon, a recursive trigger value, and a list of recursive triggers from the at least one recursive chunking parameter;
- computing hash values at each position within the local chunk list;
- applying a mathematical function to hash values located within the chunking horizon around each position within the local chunk list;
- designating at least one of cut-points and chunking boundaries when the mathematical function is satisfied; and
- chunking the local chunk list with the designated cut-points.

88. (Previously Presented) The computer-implemented method of Claim 87, where the mathematical function is arranged as: a predicate that maps hash values into Boolean values, a first function that partitions hash values into a small domain, a second function that determines a maximum value within the horizon, a third function that determines a minimum value within the horizon, a fourth function that evaluates differences between hash values within the horizon, a fifth function that sums hash values within the horizon, and a sixth function that calculates a mean of hash values within the horizon.

89. (Previously Presented) The computer-implemented method of Claim 87, further comprising adjusting the at least one recursive chunking parameter based on at least one member of a group comprising: a data type associated with the local object, a data type associated with the remote object, an environmental constraint associated with the local device, an environmental constraint associated with the remote device, the characteristics of a communication medium coupling the local device and the remote device, a usage model associated with the local object, and a usage model associated with the remote object.

90. (Cancelled).

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94. (Cancelled).

95. (Cancelled).

96. (Cancelled).

97. (Cancelled).

98. (Cancelled).

99. (Cancelled).

100. (Previously Presented) A computer-implemented method for updating an object between a local device and a remote device, each being separate computing devices, the computer-implemented method comprising the remote device performing the following steps:

partitioning a remote object into variably sized chunks;

computing a signature and a chunk length for each variably sized chunk of the remote object, wherein each of the signatures and the chunk lengths create a remote chunk list;

generating a remote recursive chunk list by recursively partitioning the remote chunk list into variably sized recursive chunks;

sending the remote recursive chunk list to the local device with the remote device;

receiving a request from the local device for a recursive chunk associated with the remote object after sending the remote recursive chunk list to the local device; and

sending the recursive chunk to the local device after receiving the request.

101. (Previously Presented) The computer-implemented method of Claim 100, wherein generating the remote recursive chunk list, further comprises:

partitioning the remote chunk list into variably sized recursive chunks;

computing a recursive signature and a recursive chunk length for each variably sized recursive chunk of the remote chunk list; and

assembling the remote recursive chunk list with the recursive signatures and recursive chunk lengths.

102. (Previously Presented) The computer-implemented method of Claim 100, wherein partitioning the remote object further comprises applying a fingerprint function to the remote object to generate fingerprints, and partitioning the remote object into the variably sized chunks based on the fingerprints.

103. (Previously Presented) The computer-implemented method of Claim 102, wherein applying the fingerprinting function further comprises providing a window that surrounds a position in the remote object; and computing a value from byte values that are located within the window.

104. (Cancelled).

105. (Currently Amended) The computer-implemented method of Claim [[104]] 103, further comprising wherein dynamically adjusting the size of the window ~~further comprises by~~ adjusting the size of the window based on at least one member of a group comprising: a data type associated with the local object, a data type associated with the remote object, an environmental constraint associated with the local device, an environmental constraint associated with the remote device, the characteristics of a communication medium coupling the local device and the remote device, a usage model associated with the local object, and a usage model associated with the remote object.

106. (Cancelled).

107. (Previously Presented) The computer-implemented method of claim 101, wherein partitioning the remote chunk list into variably sized recursive chunks further comprises:
determining at least one recursive chunking parameter;

determining at least one member of the group comprising a recursive horizon, a recursive trigger value, or a list of recursive triggers from the at least one recursive chunking parameter;
computing hash values at each position within the remote chunk list;
applying a mathematical function to hash values located within the chunking horizon around each position within the remote chunk list;
designating at least one of cut-points and chunking boundaries when the mathematical function is satisfied; and
partitioning the remote chunk list with the designated cut-points.

108. (Cancelled).

109. (Previously Presented) The computer-implemented method of Claim 107, further comprising: adjusting the at least one recursive chunking parameter based on at least one member of the group comprising: a data type associated with the local object, a data type associated with the remote object, an environmental constraint associated with the local device, an environmental constraint associated with the remote device, the characteristics of a communication medium coupling the local device and the remote device, a usage model associated with the local object, and a usage model associated with the remote object.

110. (Previously Presented) The computer-implemented method of Claim 100, further comprising:
partitioning the local object into variably sized chunks with the local device;
computing a local signature and a local chunk length for each variably sized chunk of the local object with the local device, wherein each of the local signatures and the local chunk lengths create a local chunk list;
generating a local recursive chunk list by recursively chunking the local chunk list into variably sized recursive local chunks with the local device;
receiving the remote recursive chunk list from the remote device with the local device;

comparing the remote recursive chunk list to the local recursive chunk list with the local device to identify any differences between the local chunk list and the remote chunk list;

comparing the remote chunk list associated with the remote object to the local chunk list with the local device to identify any differences between the local object and the remote object;

sending the request from the local device for the recursive chunk associated with the remote object when the comparison determines a difference;

receiving the recursive chunk from the remote device after sending the request; and

updating or synchronizing the local object with the at least one recursive chunk when received from the remote device.

111. (Cancelled).

112. (Cancelled).

113. (Cancelled).

114. (Cancelled).

115. (Cancelled).

116. (Cancelled).

117. (Cancelled).

118. (Cancelled).

119. (Cancelled).